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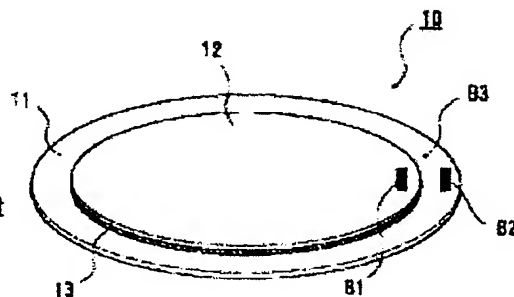
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(54) SOI WAFER LASER MARK PRINTING METHOD AND SOI WAFER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an SOI wafer laser mark printing method which is capable of printing a laser mark which can be accurately read by an optical character reader on an SOI wafer and the SOI wafer.

SOLUTION: A laser mark is printed on either the surface of a SOI layer or a terrace of the surface of a base wafer after an SOI wafer is finished (1), or a part covering a laser mark printed area on a base wafer out of a bond wafer is removed, and an opening which uncovers the laser mark printed area is formed (2), or a laser mark is previously printed on a region of the surface of the base wafer which does not overlap with the bond wafer before a base wafer and a bond wafer are bonded together (3), or a part of a bond wafer overlapping with a laser mark printed area is removed before a base wafer where a laser mark is previously printed and a bond wafer are bonded together (4).



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CLAIMS

[Claim(s)]

[Claim 1]the surface of said SOI layer after producing a SOI wafer characterized by comprising the following -- or, A laser mark printing method of a SOI wafer printing a laser mark without receiving any they are among the surfaces of said base wafer which exists outside an outer edge of said SOI layer, and straddling a boundary of these both the surfaces.

A base wafer.

A SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer.

[Claim 2]A laser mark printing method of a SOI wafer characterized by removing a wrap part for said laser mark, and forming an opening on this laser mark by performing an etching process to a SOI wafer characterized by comprising the following.

A laser mark is beforehand printed on the surface of a base wafer, and it is this base wafer. A SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer.

[Claim 3]It faces producing a SOI wafer characterized by comprising the following, A laser mark printing method of a SOI wafer characterized by printing said laser mark beforehand into a portion which is not covered with said bond wafer of inside on said surface of a base wafer before combining a bond wafer which constitutes said SOI layer on the surface of said base wafer.

A base wafer.

A SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer.

[Claim 4]Print a laser mark beforehand on the surface of a base wafer, and This base wafer, It faces producing a SOI wafer provided with a SOI layer combined via an insulating

layer which consists of oxide films on the surface of this base wafer, So that said laser mark may not be covered with this bond wafer by combining a bond wafer which constitutes said SOI layer on said base wafer, A laser mark printing method of a SOI wafer removing said some of bond wafers beforehand before said combination.

[Claim 5]in a SOI wafer provided with a base wafer and a SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer -- the surface of said SOI layer -- or, A SOI wafer, wherein a laser mark is printed without having received any of the surface of said base wafer which exists outside an outer edge of said SOI layer they were, and straddling a boundary of these both the surfaces.

[Claim 6]A laser mark is a SOI wafer provided with a base wafer printed on the surface, and a SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer, and said laser mark by a wrap part being removed. A SOI wafer, wherein this laser mark is exposed.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the laser mark printing method of a SOI wafer, and a SOI wafer.

[0002]

[Description of the Prior Art]Conventionally, in the manufacturing process of semiconductor devices, such as LSI, in order to identify and manage a wafer, generally the process of printing a laser mark to each wafer is performed, and, thereby, management of wafer each is performed efficiently.

[0003]The size of a character of the above-mentioned laser mark is usually about 1-2 mm. It is common to be printed from the periphery of the above-mentioned wafer by the field up to about 3 mm in a central direction for the sake of the convenience which prints the character of this size.

[0004]Technology of manufacturing a device using the SOI (Silicon On Insulator) wafer provided with the various outstanding features is put in practical use these days.

[0005]This SOI wafer is covered with a base wafer and an oxide film (silicon oxide). It is constituted by pasting together directly the bond wafer which forms a SOI layer, and the insulating layer which consists of the above-mentioned oxide film formed in the lamination side (joint interface) separates electrically the above-mentioned base wafer and the above-mentioned SOI layer. The silicon wafer in which the above-mentioned oxide film was formed may be used as a base wafer.

[0006]referring to drawing 5 here -- a smart cut (smart cut (registered trademark)) -- the outline of the manufacturing method of the SOI wafer called law is explained. Drawing 5 is a flow chart explaining the manufacturing process of the SOI wafer by the smart cutting method.

[0007]First, two silicon wafers (the base wafer 1, the bond wafer 2) are prepared (Step S101), and the oxide film 3 is formed in the surface of at least one silicon wafer (bond wafer

2) before long (Step S102).

[0008]Subsequently, after pouring a hydrogen ion (H^+) or a rare gas ion into the bond wafer 2 in which the oxide film 3 was formed and forming the minute bubble layer 4 in bond wafer 2 inside (Step S103), the field which poured in the above-mentioned ion at the room temperature is stuck to the base wafer 1 (Step S104). Under the present circumstances, the base wafer 1 and the bond wafer 2 are combined with the van der Waals (van der Waals) power of acting between the water molecules adsorbed on each surface, without applying external force.

[0009]subsequently -- heat-treating and making the minute bubble layer 4 into the surface of separation -- the bond wafer 2 -- being filmy (SOI layer 6 and the embedded oxide film 7) -- heat treatment is added and let combination be a firm thing, after dissociating (Step S105) (Step S106).

[0010]Mirror-polishing processing is performed to SOI layer 6 after Step S106 (Step S107), and SOI wafer 8 is completed (refer to JP,H5-211128,A above).

[0011]SOI wafer 8 manufactured by the described method, Since between SOI layer 6 and the base wafers 1 is separated with the embedded oxide film 7 (insulating layer), Even if it makes the element constituted on SOI wafer 8 approach, it is hard to produce leakage current, and for the reason, improvement in the performance under the working speed and high tension of LSI, and the densification and low power consumption of LSI can be realized.

[0012]Even when a device was manufactured using the above-mentioned SOI wafer, rationalization of the same device fabrication process as the case where the conventional wafer is used was desired by managing a wafer by a laser mark.

[0013]

[Problem to be solved by the invention]However, in the above-mentioned SOI wafer, there was a case where reading of a laser mark was not correctly performed by OCR (Optical Character Reader; optical character reader).

[0014]SUBJECT of this invention is providing a laser mark printing method of a SOI wafer printable to a SOI wafer, and a SOI wafer for a laser mark which can be correctly read with an optical character reader.

[0015]

[Means for solving problem]A terrace (.) on a SOI wafer manufactured by the above-mentioned smart cutting method Namely, it is on the surface of said base wafer containing a plane of union with a SOI layer, Generally field width between a periphery of a base wafer and a periphery of a SOI layer is narrow, When a laser mark with a size of about 1-2 mm pastes together to a central direction in a field up to about 3 mm from a base wafer periphery and it is printed beforehand before, a SOI layer laps with the printing unit concerned, and a portion (uncombined portion) which is not pasted together may be formed.

[0016]As the above-mentioned uncombined portion is shown, for example in drawing 6,

form (uneven part shown in mark A3 in a figure) where a SOI layer shown in a base wafer shown in the mark A1 in a figure and the mark A2 in a figure became intricate intricately is accomplished, Since light of reflectivity which is different from a base wafer and a SOI layer, respectively came on the contrary even if it irradiates with light of the same intensity on the outskirts of the printing unit of a laser mark "EH", reading by OCR was not performed correctly.

[0017]The above-mentioned uncombined portion in the border area of the SOI layer which serves as a generation cause of flakes or particle, or is shown in mark A4 in a figure in order that the above-mentioned base wafer and the above-mentioned SOI layer may accomplish the intricately complicated form, as shown in mark A3 in a figure, Inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects had arisen.

[0018]In order to solve an aforementioned problem, invention indicated to Claim 1, the surface of said SOI layer after producing a SOI wafer provided with a base wafer and the SOI layer combined via the insulating layer which consists of oxide films on the surface of this base wafer – or, It is a laser mark printing method of the SOI wafer printing a laser mark, without receiving any they are among the surfaces of said base wafer which exists outside the outer edge of said SOI layer, and straddling the boundary of these both the surfaces.

[0019]Thus, since a laser mark is printed after completion of a SOI wafer according to the invention according to claim 1, In lamination processing with a base wafer and a bond wafer, and an etching process process, the portion into which the base wafer and SOI layer of the above-mentioned laser mark printing unit circumference became intricate intricately is not formed.

[0020]Therefore, reading of the above-mentioned laser mark becomes possible correctly by OCR, and generating of flakes or particle is prevented and inconvenience, like a resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0021]Invention indicated to Claim 2 in order to solve an aforementioned problem, Print a laser mark beforehand on the surface of a base wafer, and This base wafer, By performing an etching process to a SOI wafer provided with a SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer, It is a laser mark printing method of a SOI wafer removing a wrap part for said laser mark, and forming an opening on this laser mark.

[0022]Thus, since according to the invention according to claim 2 an etching process removes a wrap insulating layer and a SOI layer for the printing unit of a laser mark and the laser mark printing unit concerned on the base wafer surface is exposed, A portion into which the above-mentioned base wafer and a SOI layer became intricate intricately is not formed in this printing unit.

[0023]Therefore, reading of the above-mentioned laser mark becomes possible correctly by

OCR, and generating of flakes or particle is prevented and inconvenience, like a resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost. And since it does not call at a printing part of a laser mark but the above-mentioned laser mark printing unit can be exposed, it becomes the thing excellent in convenience.

[0024]Invention indicated to Claim 3 in order to solve an aforementioned problem, It faces producing a SOI wafer provided with a base wafer and a SOI layer combined via an insulating layer which consists of oxide films on the surface of this base wafer, Before combining a bond wafer which constitutes said SOI layer on the surface of said base wafer, it is a laser mark printing method of a SOI wafer printing said laser mark beforehand into a portion which is not covered with said bond wafer of inside on said surface of a base wafer.

[0025]Thus, since a laser mark is beforehand printed in a field which is on the base wafer surface and does not lap with a bond wafer through a manufacturing process of a SOI wafer according to the invention according to claim 3, A portion into which a base wafer and a SOI layer became intricate intricately is not formed in the printing unit of the laser mark concerned.

[0026]Therefore, reading of the above-mentioned laser mark becomes possible correctly by OCR, and generating of flakes or particle is prevented and inconvenience, like a resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost. Since it becomes printable [a laser mark which can be correctly read by OCR], without changing a SOI manufacturing process in addition to a process of printing a laser mark, saving of a drug solution required for an etching process etc., time, etc. is achieved.

[0027]Invention indicated to Claim 4 in order to solve an aforementioned problem, Print a laser mark beforehand on the surface of a base wafer, and This base wafer, It faces producing a SOI wafer provided with the SOI layer combined via the insulating layer which consists of oxide films on the surface of this base wafer, So that said laser mark may not be covered with this bond wafer by combining the bond wafer which constitutes said SOI layer on said base wafer, It is a laser mark printing method of the SOI wafer removing said some of bond wafers beforehand before said combination.

[0028]According to the invention according to claim 4, print a laser mark beforehand on the surface of a base wafer, and Thus, this base wafer, It faces producing a SOI wafer provided with the SOI layer combined via the insulating layer which consists of oxide films on the surface of this base wafer, So that said laser mark may not be covered with this bond wafer by combining the bond wafer which constitutes said SOI layer on said base wafer, Since a bond wafer and a base wafer are combined so that said some of bond wafers may be removed beforehand and the above-mentioned laser mark printing unit may be exposed by the removed portion concerned after that before said combination, A bond wafer and the laser mark printing unit do not lap through the manufacturing process of a SOI wafer, and the portion into which the above-mentioned base wafer and the SOI layer became intricate intricately is not formed around the laser mark printing unit.

[0029]Therefore, reading of the above-mentioned laser mark becomes possible correctly by OCR, and generating of flakes or particle is prevented and inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost. Since what is necessary is just to change the portion beforehand removed among bond wafers according to the print position of the laser mark on a base wafer, the print position of a laser mark can be set up freely and improvement in convenience is achieved.

[0030]And invention indicated to Claim 5 in order to solve SUBJECT of this invention, in a SOI wafer provided with a base wafer and the SOI layer combined via the insulating layer which consists of oxide films on the surface of this base wafer -- the surface of said SOI layer -- or, The laser mark was printed without having received any of the surface of said base wafer which exists outside the outer edge of said SOI layer they were, and straddling the boundary of these both the surfaces.

[0031]Thus, according to the invention according to claim 5, reading of a laser mark becomes possible correctly by OCR, and generating of flakes or particle is prevented and inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0032]Since a bond wafer is not processed by deletion etc., the usable area which can be used as an element among SOI wafers is maintainable.

[0033]And invention indicated to Claim 6 in order to solve SUBJECT of this invention, A laser mark is a SOI wafer provided with the base wafer printed on the surface, and the SOI layer combined via the insulating layer which consists of oxide films on the surface of this base wafer, and said laser mark by a wrap part being removed. This laser mark is exposed.

[0034]Thus, according to the invention according to claim 6, reading of a laser mark becomes possible correctly by OCR, and generating of flakes or particle is prevented and inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0035]Since a wrap part is compulsorily removed in a laser mark, all the laser mark printing units concerned on the base wafer surface can be exposed certainly.

[0036]

[Mode for carrying out the invention]Hereafter, the laser mark printing method of the SOI wafer which applied this invention, and a SOI wafer are explained in detail. This embodiment explains on the assumption that the case where the SOI manufacturing method (refer to drawing 5) called the smart cutting method is applied.

[0037][A 1st embodiment] With reference to drawing 1 and drawing 5, the laser mark printing method of the SOI wafer in a 1st embodiment that applied this invention, and a SOI wafer are explained in detail. Drawing 1 is a figure showing the printing part of the laser mark on the SOI wafer after completion.

[0038]After a 1st embodiment produces the SOI wafer provided with the base wafer and the

SOI layer combined on the surface of the base wafer concerned via the insulating layer which consists of oxide films, SUBJECT of this invention is solved by printing a laser mark on the surface of either, while on the surface of this SOI layer, or the surface of a base wafer which exists outside the outer edge of the SOI layer concerned.

[0039]SOI wafer 10, the base wafer 11, SOI layer 12, and the embedded oxide film 13 which are shown in drawing 1, The base wafer 1, SOI layer 6, and the embedded oxide film 7 which are the components of SOI wafer 8 produced through each process to Step S106 shown in drawing 5 and this SOI wafer 8 are supported, respectively. The laser mark is not printed by the base wafer 11 in this stage.

[0040]SOI wafer 10 has a circular field called the terrace shown in the mark B3 in a figure between the periphery of SOI layer 12, and the periphery of the base wafer 11 among the surface.

[0041]So, in this embodiment, the above-mentioned laser mark is printed to either among the printing part (for example, mark B1 in a figure) on the surface of SOI layer 12, or the printing part (for example, mark B-2 in a figure) in the terrace on the surface of the base wafer 11.

[0042]As explained above, in a 1st embodiment. the surface top of SOI layer 12 of produced SOI wafer 10 -- or, Since a laser mark is printed among the terrace sections shown in the mark B3 in a figure they to be [any], when reading a laser mark by OCR, the reflected light from the laser mark printing unit circumference turns into only one of reflected lights among a SOI layer or a base wafer. Therefore, reading of the laser mark by OCR is performed correctly.

[0043]Since the laser mark printing unit circumference does not accomplish the form (refer to drawing 6) where the SOI layer and the base wafer became intricate, Generating of flakes or particle is controlled and inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0044]The printing part of a laser mark cannot be restricted to the position shown in the mark B1 in a figure of drawing 1, and B-2, and can be freely set up on the SOI layer 12 surface or in the above-mentioned terrace.

[0045][A 2nd embodiment] With reference to drawing 2 and drawing 5, a laser mark printing method of a SOI wafer in a 2nd embodiment that applied this invention, and a SOI wafer are explained in detail. Drawing 2 is a sectional view of a SOI wafer in which a wrap part is shown for the laser mark printing unit upper part to a SOI wafer to which an oxide film adhered.

[0046]A 2nd embodiment prints a laser mark beforehand on the surface of a base wafer, and This base wafer, As opposed to a SOI wafer provided with a SOI layer combined via an insulating layer which consists of oxide films on the surface of the base wafer concerned, SUBJECT of this invention is solved by an etching process's removing parts, such as a SOI layer laminated to the printing unit upper part of the above-mentioned laser mark, and forming an opening which exposes the whole laser mark printing unit concerned.

[0047]SOI wafer 10a shown in drawing 2 supports the state where the oxide film was formed in the whole surface of the SOI wafer in Step S105 shown in drawing 5.

[0048]SOI wafer 10a shown in drawing 2 is provided with the base wafer 11a, SOI layer 12a, and the embedded oxide film 13a, and when the base wafer 11a and SOI layer 12a join together on both sides of the embedded oxide film 13a, it is constituted. It is covered with the whole surface with the oxide film (silicon oxide) 14. Here, in the surface of the base wafer 11a, the laser mark shown in the mark C1 in a figure is printed beforehand.

[0049]The oxide film 14 which SOI wafer 10a was produced through each process to Step S106 in the smart cutting method shown in drawing 5, and has covered the whole surface, It is formed by performing heat treatment performed since the bond strength of the base wafer 11a and SOI layer 12a is increased by an oxidizing atmosphere.

[0050]The part shown in the mark C2 in a figure is SOI layer 12a, the embedded oxide film 13a, and the oxide film 14 which are laminated on the laser mark shown in the mark C1 in a figure. An opening can be formed on the printing unit of the laser mark C1 by removing the oxide film 14, SOI layer 12a, and the embedded oxide film 13a which are these-laminated by etching one by one.

[0051]Although this opening is set only to the size in which the whole laser mark C1 is exposed at least, Reading of the laser mark C1 can be ensured by it being still more preferred to also set the surrounding portion of the laser mark C1 as the size which carries out certain quantity exposure, and carrying out the effective use area as an element in this way within limits which are not reduced so much. Hereafter, the formation procedure of an opening is explained in detail.

[0052]First, the whole SOI wafer 10a except the field (namely, surface of the part shown in the mark C2 in a figure) shown in the mark C3 in a figure is covered, for example with a chemical-resistant masking tape.

[0053]Subsequently, the drug solution of fluoric acid systems, such as HF and BHF (Buffered HF), removes the oxide film 14 which has exposed the field C3 which is not covered with the above-mentioned masking tape, and SOI layer 12a is exposed.

[0054]After removing the masking tape which had covered above-mentioned SOI wafer 10a, Etching removal of SOI layer 12a exposed in the described area C3 by using the oxide film 14 as a mask is carried out with the drug solution of alkali systems, such as HF, a nitric acid system, NaOH, and KOH, or an alcohol system, and the embedded oxide film 13a is exposed.

[0055]Subsequently, the whole printing unit of the laser mark C1 is exposed by removing the embedded oxide film 13a exposed over the described area C3 with the drug solution of fluoric acid systems, such as HF and BHF. Simultaneously, the oxide film 14 which has covered the surface of SOI wafer 10a is also removed.

[0056]As explained above, in a 2nd embodiment, an etching process removes the oxide film 14 in the field which shows the laser mark C1 printed beforehand to the base wafer 11a at the mark C2 in a wrap figure, SOI layer 12a, and the embedded oxide film 13a. Thereby,

since an opening (field C2 in a figure) is formed on the laser mark C1, the laser mark C1 can be exposed.

[0057]Therefore, since only the reflected light from the base wafer 11a will be read when reading the laser mark C1 by OCR, reading of the laser mark C1 by OCR is performed correctly.

[0058]On the outskirts of the printing unit of the laser mark C1 (namely, base of the opening shown in the mark C2 in a figure). Since only the surface of the base wafer 11 is exposed and the form (refer to drawing 6) where the SOI layer and the base wafer became intricate is not formed, The generation cause of flakes or particle is controlled and inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0059]In a 2nd embodiment, after covering the whole SOI wafer 10a except the surface (field C3) of the part shown in the mark C2 in a figure with a chemical-resistant masking tape, had removed the oxide film 14 exposed over the described area C3, but. Not only this but after applying the resist for photolithographies to the whole SOI wafer 10a, ranking second and, exposing only the resist on the described area C3 by ultraviolet radiation for example, the same etching process as the above may remove.

[0060]In this case, the above-mentioned resist does so a role of the chemical-resistant above-mentioned masking tape. That is, when the above-mentioned resist removes the oxide film 14 exposed over the described area C3 with a drug solution of the above-mentioned fluoric acid system, it functions as a coating material.

[0061]It is possible to call at neither a position of a laser mark nor a connecting position of a SOI layer, but to remove a wrap part for a laser mark with the above-mentioned technique, and to expose the printing unit concerned, therefore setting out of a position of these laser marks or a connecting position of a SOI layer is free. Since for this reason it does not call at a printing part of a laser mark but the above-mentioned laser mark printing unit on the base wafer surface can be exposed, it becomes the thing excellent in convenience.

[0062]For example, even when a laser mark is printed by portion shown in the mark C4 in a figure over a boundary of the oxide film 14, SOI layer 12a, etc., it can apply.

[0063]In this case, first, by using the chemical-resistant above-mentioned mask tape or a resist as a coating material, an oxide film in a field shown in the mark C5 in a figure with a drug solution of fluoric acid systems, such as HF and BHF, is removed, and SOI layer 12a is exposed.

[0064]Subsequently, after removing the above-mentioned coating material, a drug solution of alkali systems, such as HF, a nitric acid system, NaOH, and KOH, or an alcohol system removes SOI layer 12a exposed in the described area C5, and the embedded oxide film 13a is exposed.

[0065]Subsequently, the drug solution of fluoric acid systems, such as HF and BHF, removes the embedded oxide film 13a and the oxide film 14 which were exposed in the described area C5. Thereby, the whole laser mark printing unit shown in the above C4 is

exposed. Although a 2nd embodiment explained the case where the oxide film 14 was formed by heat-of-linkage processing of Step S106, it can also carry out by adding an oxidation process after Step S107.

[0066][A 3rd embodiment] With reference to drawing 3 and drawing 5, the laser mark printing method of the SOI wafer in a 3rd embodiment that applied this invention, and a SOI wafer are explained in detail.

[0067]Drawing 3 is a sectional view showing the part which is in the outer peripheral part on the base wafer which does not lap with a bond wafer, and prints a laser mark beforehand before combination with a bond wafer.

[0068]When a 3rd embodiment produces a SOI wafer provided with a base wafer and a SOI layer combined via an insulating layer which consists of oxide films on the surface of the base wafer concerned, Before combining the above-mentioned base wafer and a bond wafer which forms the above-mentioned SOI layer, SUBJECT of this invention is solved by printing a laser mark beforehand in a position which exists on the outskirts of an outer peripheral part on the above-mentioned base wafer surface, and does not lap with the above-mentioned bond wafer.

[0069]The base wafer 11b shown in drawing 3 and the bond wafer 20 are equivalent to the base wafer 1 and the bond wafer 2 in Step S101 shown in drawing 5, respectively. That is, a 3rd embodiment is applied at a process of Step S101 shown in drawing 5.

[0070]The base wafer 11b shown in drawing 3 has a field (for example, field shown in the agreement D1 among a figure) which does not lap with the bond wafer 20. This field is a field which originates in polish sagging generated unescapable by mechanochemical polishing at the time of carrying out mirror-polishing finishing of the base wafer, is usually formed in about 1-2 mm from a wafer outermost periphery, and serves as terrace sections of the last SOI wafer.

[0071]So, in this embodiment, before combining the base wafer 11b and the bond wafer 20, a laser mark shown in the mark D2 in a figure is printed in the described area D1. Then, a SOI wafer is produced based on the smart cutting method shown in drawing 5.

[0072]As explained above, before combining the bond wafer 20 with the base wafer 11b, by a 3rd embodiment, the laser mark D2 is beforehand printed to a field which does not lap with the bond wafer 20 among on the surface of the base wafer 11b.

[0073]Therefore, the laser mark D2 is not covered with the bond wafer 20 (SOI layer), and, as for the printing unit circumference of the laser mark D2, only the surface of the base wafer 11b is exposed until a SOI wafer is produced (Step S101 shown in drawing 5 - S106 reference).

[0074]When reading a laser mark by OCR for this reason, since only the reflected light from the base wafer 11a is emitted, from the printing unit circumference of the laser mark D2, reading of the laser mark by OCR is performed correctly.

[0075]Since the form (refer to drawing 6) where the SOI layer and the base wafer became intricate is not formed on the outskirts of the printing unit of the laser mark D2, The

generation cause of flakes or particle is controlled and inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0076]Since it becomes printable [a laser mark which can be correctly read by OCR], without changing a SOI manufacturing process in addition to a process of printing a laser mark, saving of a drug solution required for an etching process etc., time, etc. is achieved.

[0077][A 4th embodiment] With reference to drawing 4 (a) and drawing 5, a laser mark printing method of a SOI wafer in a 4th embodiment that applied this invention, and a SOI wafer are explained in detail. Contents shown in drawing 4 (b) and (c) are the modifications of contents shown in drawing 4 (a), and are explained in full detail behind.

[0078]A 4th embodiment prints a laser mark beforehand on the surface of a base wafer, and This base wafer, It faces producing a SOI wafer provided with the SOI layer combined via the insulating layer which consists of oxide films on the surface of this base wafer, By combining the bond wafer which constitutes a SOI layer on a base wafer, as a laser mark is not covered with this bond wafer, it is a thing which removes some bond wafers beforehand before combination and which solves SUBJECT of this invention as be alike rattlingly.

[0079]As shown in drawing 4 (a), the base wafer 11c and the bond wafer 21c are equivalent to the base wafer 1 and the bond wafer 2 in Step S101 shown in drawing 5, respectively. That is, a 4th embodiment is applied at the process of Step S101 shown in drawing 5.

[0080]The orientation flat part 111c is formed, and the laser mark shown in the outer edge section located in the opposite hand of the orientation flat part 111c, for example at the mark E1 in a figure is beforehand printed by the base wafer 11c.

[0081]The wrap portion is beforehand removed before combination in the laser mark E1 by combining the bond wafer 21c with the base wafer 11c. As shown in drawing 4, this bond wafer 21c is combined on the base wafer 11c so that the laser mark E1 may not be covered with this bond wafer 21c. Therefore, the laser mark E1 will be in the state where it exposed to the surface of the SOI wafer concerned. In this case, by making into the orientation flat part 111c and identical shape of the base wafer 11c the portion (orientation flat part 121c) for which the bond wafer 21c is removed beforehand, Since the bond wafer 21c and the base wafer 11c can be used as the wafer of the same specification, it is not necessary to prepare both wafers independently, and is efficient.

[0082]As explained above, in a 4th embodiment, a wrap portion is beforehand removed for the printing unit of the laser mark E1 before combination by combining with the base wafer 11c among the bond wafers 21c.

[0083]Therefore, the bond wafer 21c does not lap with the printing unit of the laser mark E1 through the manufacturing process (Step S101 shown in drawing 5 - S107 reference) of a SOI wafer, Since only the reflected light from the base wafer 11c will be read when reading a laser mark by OCR, reading of a laser mark is performed correctly.

[0084]Since the portion (refer to drawing 6) into which the SOI layer and the base wafer

became intricate is not formed on the outskirts of the printing unit of the laser mark E1, generating of flakes or particle is controlled, and. Inconvenience, like the resist applied when carrying out pattern formation on a SOI wafer by a photolithography collects is also lost.

[0085]Since what is necessary is to rotate the portion which changed the portion beforehand removed among the bond wafers 21c according to the print position of the laser mark E1 on the base wafer 11c, or was removed, and just to paste together, the print position of a laser mark can be set up freely and improvement in convenience is achieved.

[0086]To a 4th embodiment, the bond wafer 22c shown in the Drawing (b) and (c) and the bond wafer 23c can be considered, for example as a modification of the bond wafer 21c shown in drawing 4 (a). Hereafter, the modification of a 4th embodiment is explained with reference to drawing 4 (b) and drawing 4 (c).

[0087]First, the modification shown in drawing 4 (b) is explained. It carries out considerable [of the base wafer 11c shown in drawing 4 (b), and the bond wafer 22c] to the base wafer 1 and the bond wafer 2 of Step S101 which are shown in drawing 5, respectively.

[0088]The orientation flat part 111c is formed, and the laser mark shown in the outer edge section located in the opposite hand of the orientation flat part 111c at the mark E1 in a figure is beforehand printed by the base wafer 11c.

[0089]Let the bond wafer 22c be the form which it is beforehand removed by combining with the base wafer 11c before a wrap portion's combining the laser mark E1, and also meets the base wafer 11c.

[0090]Therefore, even after combining the bond wafer 22c with the base wafer 11c, it becomes being in the state which the laser mark E1 exposed to the surface of the SOI wafer concerned with as.

[0091]Since the bond wafer 22c is the form as the base wafer 11c where everything but the portion removed beforehand is the same, the bond wafer 22c laps with the base wafer 11c exactly. Therefore, an excessive lobe (refer to drawing 4 (a)) does not arise.

[0092]Subsequently, the modification shown in drawing 4 (c) is explained. It carries out considerable [of the base wafer 11c shown in drawing 4 (c), and the bond wafer 23c] to the base wafer 1 and the bond wafer 2 of Step S101 which are shown in drawing 5, respectively.

[0093]The orientation flat part 111c is formed, and the laser mark shown around the orientation flat part 111c at the mark E2 in a figure is beforehand printed by the base wafer 11c.

[0094]The wrap portion is beforehand removed before combination in the laser mark E2 by combining with the bond wafer 23c with the base wafer 11c.

[0095]Therefore, even after combining the bond wafer 23c with the base wafer 11c, it becomes being in the state which the laser mark E2 exposed to the surface of the SOI wafer concerned with as.

[0096]This invention is not limited to the above 1st - a 4th embodiment. Namely, the above

1st - a 4th embodiment are illustration, and no matter what thing what has the substantially same composition as the technical idea indicated to the Claims of this invention, and does the same operation effect so may be, it is included by technical scope of this invention.

[0097]For example, although the 1st which applied this invention - a 4th embodiment assumed the SOI wafer which was produced by the smart cutting method (Steps S101-S107) shown in drawing 5 in any case, It is applicable even if produced, not only this but other methods (Steps S201-S207), i.e., the manufacturing method of the SOI wafer shown in drawing 7.

[0098]First, the outline of the manufacturing method of the SOI wafer shown in drawing 7 is explained. About each component in drawing 5, and the same component, identical codes are attached among each component in drawing 7, and the explanation is omitted.

[0099]In Step S201, the base wafer 1 and the bond wafer 2 are prepared. Here, the surface of the bond wafer 2 is already covered with the oxide film 3a.

[0100]Subsequently, the base wafer 1 and the bond wafer 2 are pasted together at ordinary temperature (Step S201). Under the present circumstances, the base wafer 1 and the bond wafer 2 are combined with the van der Waals (van der Waals) power of acting between the water molecules adsorbed on each surface, without applying external force (Step S202).

[0101]Subsequently, in order to make firm lamination of the base wafer 1 and the bond wafer 2 which were performed at Step S202, the whole is heat-treated by an oxidizing atmosphere (Step S203). Under the present circumstances, the oxide film 3b adheres to the surface of the base wafer 1. Then, processing which removes the uncombined portion of a periphery at Step S204 is performed, and thinning processing treatment to SOI layer 6 is performed (Step S205).

[0102]Subsequently, after adding the gas-phase-etching process (Step S206) called the PACE (Plasma Assisted Chemical Etching) method if needed and passing through the thin film-ized processing to SOI layer 6, It results in the completion of SOI wafer 8 which has the stratum-like structure which SOI layer 6 laminated on the base wafer 1 via the embedded oxide film 7 by removing the oxide film 3b of base wafer 1 rear face (Step S207).

[0103]The laser mark printing method in a 1st embodiment of the above prints a laser mark to the SOI wafer after completion, and is applied to SOI wafer 8 of Step S207 shown in drawing 7.

[0104]The laser mark printing method in a 2nd embodiment of the above adds a scaling process after the thinning processing of SOI layer 6 performed by Step S205 or S206, and is applied. That is, Step S205 or after S206, SOI wafer 8 is heat-treated in oxygen environment, a wrap scaling process is added with an oxide film, the surface is performed, and the laser mark printing method in a 2nd embodiment of the above is applied after that.

[0105]The laser mark printing method in a 2nd embodiment of the above can be applied even when not adding the above-mentioned scaling process Step S205 or after S206, and the laser mark printing method concerned is changed as follows in this case. Hereafter, although explained with reference to drawing 2, the wrap oxide film 14 does not take into

consideration the surface of SOI wafer 10a shown in drawing 2.

[O106]SOI wafer 10a shown in drawing 2 is provided with the base wafer 11a, SOI layer 12a, and the embedded oxide film 13a, and the base wafer 11a and SOI layer 12a are constituted by joining together on both sides of the embedded oxide film 13a (the oxide film 14 has not adhered). Here, in the surface of the base wafer 11a, a laser mark shown in the mark C1 in a figure is printed beforehand.

[O107]First, except for the surface of a field shown in the mark C3 in a figure, i.e., a part shown in the mark C2 in a figure, the whole SOI wafer 10a is covered by chemical-resistant masking tape or a resist. By a resist, after exposing a field shown in the mark C3 in a figure after a wrap case's applying a resist to the whole SOI wafer 10a by ultraviolet radiation, an etching process is carried out and a resist of the field C3 is removed.

[O108]Subsequently, a drug solution of alkali systems, such as HF, a nitric acid system, NaOH, and KOH, or an alcohol system removes SOI layer 12a exposed in the field C3 which is not covered with the above-mentioned masking tape or a resist, and the embedded oxide film 13a is exposed.

[O109]An opening is formed in the field which removes the embedded oxide film 13a exposed over the described area C3 with the drug solution of fluoric acid systems, such as HF and BHF, and shows it to the mark C2 in a figure after removing the masking tape or resist which had covered above-mentioned SOI wafer 10a. Thereby, the whole printing unit of the laser mark C1 is exposed.

[O110]The laser mark printing method in a 3rd embodiment of the above is applied to the base wafer 1 of Step S201 shown in drawing 7.

[O111]The laser mark printing method in a 4th embodiment of the above is applied to the bond wafer 2 of Step S201 shown in drawing 7. Under the present circumstances, beforehand, the orientation flat is formed and the laser mark is printed by the base wafer 1 of Step S201.

[Effect of the Invention]As explained above, in this invention, after completion of 1 SOI wafer The surface of a SOI layer, or to either a laser mark among the terraces on the base wafer surface, [print or] 2) removing a wrap portion for the laser mark printing unit on a base wafer among bond wafers, and the opening which exposes the laser mark printing unit concerned, [form or] 3) printing a laser mark beforehand to the field which does not lap with a bond wafer while on the surface of a base wafer, or to it, before combining a base wafer and a bond wafer, 4) By removing the portion which laps with the printing unit of the laser mark concerned, before a laser mark combines the base wafer printed beforehand and a bond wafer, The SOI wafer in which the laser mark printing method and the above-mentioned laser mark of the SOI wafer printable to a SOI wafer were printed in the laser mark which can be correctly read with an optical character reader can be provided. Thereby, each SOI wafer will be managed by the laser mark printed respectively, and rationalization of a device fabrication process using a SOI wafer is attained.

[Translation done.]

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DESCRIPTION OF DRAWINGS**[Brief Description of the Drawings]**

[Drawing 1] In the laser mark printing method of the SOI wafer in a 1st embodiment that applied this invention, it is a figure showing the printing part of the laser mark on the SOI wafer after completion.

[Drawing 2] In the laser mark printing method of the SOI wafer in a 2nd embodiment that applied this invention, it is a sectional view of the SOI wafer in which a wrap part is shown for the laser mark printing unit upper part to the SOI wafer to which the oxide film adhered.

[Drawing 3] In the laser mark printing method of the SOI wafer in a 3rd embodiment that applied this invention, it is a sectional view showing the part which is in the outer peripheral part on the base wafer which does not lap with a bond wafer, and prints a laser mark beforehand before combination with a bond wafer.

[Drawing 4] (a) In the laser mark printing method of the SOI wafer in a 4th embodiment that applied this invention, - (c) is a figure which illustrates the composition of the SOI wafer which has the bond wafer from which the portion which laps with a laser mark was removed beforehand, respectively.

[Drawing 5] It is a flow chart explaining the manufacturing process of the SOI wafer by the smart cutting method.

[Drawing 6] It is an example of the form where the base wafer and SOI layer in the laser mark printing unit circumference on the surface of a base wafer became intricate intricately.

[Drawing 7] It is a flow chart explaining the manufacturing process of a SOI wafer.

[Explanations of letters or numerals]

- 1, 11, 11a-11e Base wafer
- 2, 20, 21c-23c Bond wafer
- 3, 3a, 3b, and 14 Oxide film
- 4 Minute bubble layer
- 5 Exfoliation wafer
- 6, 12, and 12a SOI layer

7, 13, and 13a embedded oxide film

8, 10, and 10a SOI wafer

111c, 121c-123c, and 222c Orientation flat part

[Translation done.]

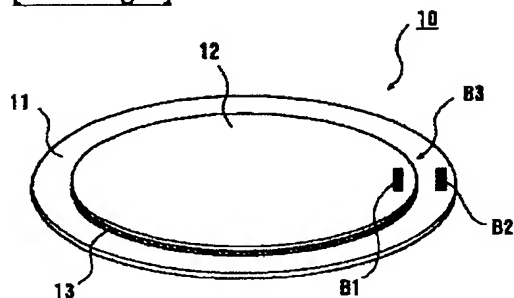
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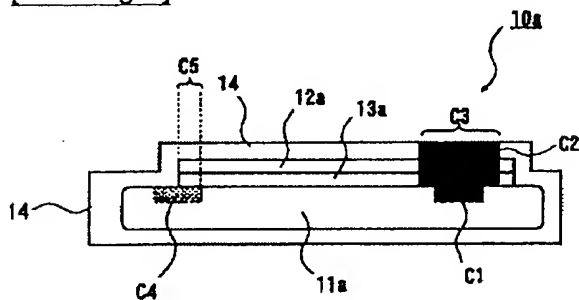
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DRAWINGS

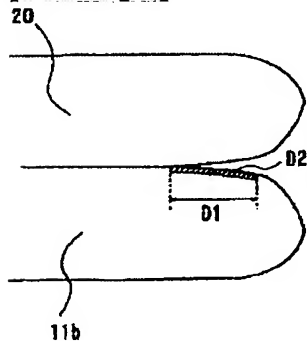
[Drawing 1]



[Drawing 2]



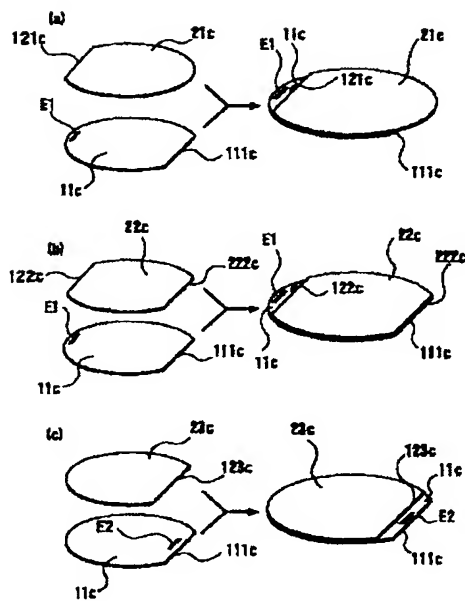
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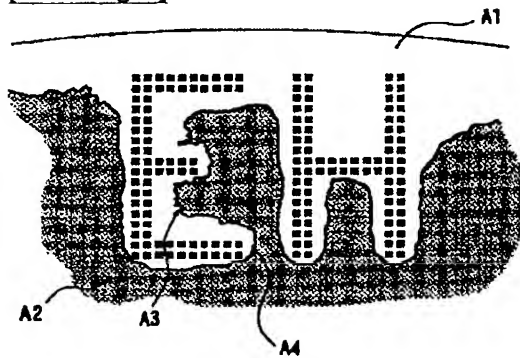
[Drawing 4]

図 4

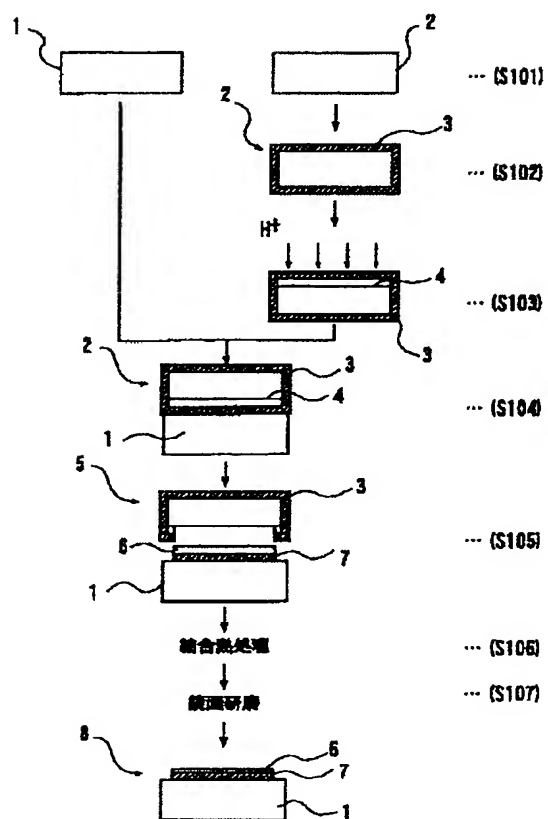
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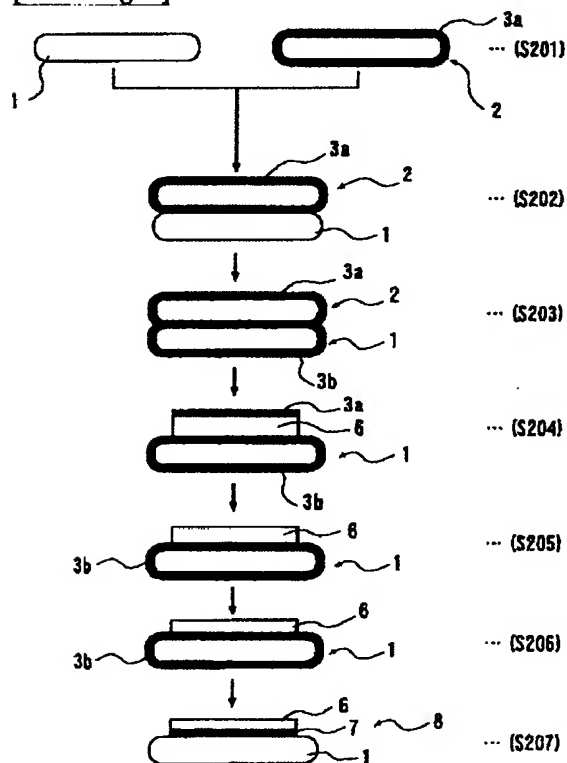
[Drawing 6]



[Drawing 5]



[Drawing 7]



[Translation done.]